METHOD AND SYSTEM FOR DISPERSION CONTROL OF ELECTROMAGNETIC SIGNALS IN COMMUNICATION NETWORKS

ABSTRACT

A method and system for dispersion control of electromagnetic signals in communication networks by narrowing the widths of electromagnetic pulses such as modulated laser signals. Generally, in the preferred embodiment, the present invention utilizes a feedback loop based on dither frequency modulation which dynamically adjusts the alignment of the laser center frequency with the filter passband. In this way, there is an acceptable tradeoff between optical power and pulse width, so a higher power laser can be used to generate a narrower optical pulse. The narrower pulses then travel farther in the fiber link before reaching their dispersion limit. It is believed that, by using this invention, existing link distance could be doubled, while re-using existing installed singlemode fiber. The systems employing the feedback loop may be information carrying or control systems employing electromagnetic waves including those waves at radio frequency, microwave frequency and optical frequency portions of an electromagnetic frequency spectrum. Thus, the electromagnetic signals may comprise radio frequency signals, microwave signals, and optical signals. When employed in laser/optical networks, the system and method of the present invention may be used to tune laser diode devices, and/or compensate for any type of wavelength-selective element in the network, including wavelength selective filters, attenuators, and switches, in fiber Bragg gratings, ring resonators in optical amplifiers, external modulators such as acousto-optic tunable filters, or array waveguide gratings. This applies to many other optical components in the network as well (for example, optical amplifiers that may act as filters when operating in the nonlinear regime). Furthermore, the system and method of the invention may be used to implement less expensive devices for all of the above application areas.